

WHAT IS CLAIMED IS:

1. A syringe driver system for expelling fluid from a syringe body, the syringe driver comprising:
  - a rotatable threaded shaft; and
  - a plunger adapted to directly engage the threaded shaft such that
- 5 rotation of the shaft drives the plunger into the syringe body.
2. The syringe driver system of claim 1 wherein the plunger is formed with a shaft engaging portion to engage with and follow the threaded shaft.
3. The syringe driver system of claim 2 wherein the shaft engaging portion comprises a threaded portion formed in the plunger.
4. The syringe driver system of claim 3 wherein the threaded portion is molded into the plunger.
5. The syringe driver system of claim 2 wherein the shaft engaging portion comprises at least one recessed half-nut.
6. The syringe driver system of claim 2 wherein the plunger comprises a flange having at least one disk, the shaft engaging portion comprising part of the flange.
7. The syringe driver system of claim 6 wherein the edges of the flange adjacent the shaft engaging portion are formed to guide the shaft engaging portion onto the threaded shaft.
8. The syringe driver system of claim 1 further comprising a guide system to secure the plunger in direct engagement with the threaded shaft.

9. The syringe driver system of claim 8 wherein the guide system comprises a first guiding element running substantially parallel to the threaded shaft and a second guiding element carried by the plunger at a position substantially opposite the position at which the plunger engages the threaded shaft such that the first and second guiding elements engage.

10. The syringe of claim 9 wherein the first guiding element comprises a guide rail and the second guiding element comprises a slot.

11. The syringe of claim 9 wherein the first guiding element comprises a channel and the second guiding element comprises a projection.

12. The syringe driver system of claim 8 wherein the plunger comprises an elongate arm positioned substantially opposite the position at which the plunger is engaged with the threaded shaft and the first guiding element comprises the arm and the second guiding element comprises a bifurcated element for straddling the arm.

13. The syringe driver system of claim 1 wherein the plunger comprises a plurality of markings adapted to indicate the movement and position of the plunger within the syringe body.

14. The syringe driver system of claim 13 wherein the plurality of markings comprise a linear grid.

15. The syringe driver system of claim 13 wherein an area of the plunger between the markers is substantially opaque and the markings comprise substantially transparent portions.

16. The syringe driver system of claim 13 further comprising a detection system having a light source and a plurality of detectors, the

detection system positioned adjacent a portion of the plunger on which the markings are located such that the light source is on one side of the portion of the plunger and the plurality of detectors is on the opposite side of the portion of the plunger and wherein the markings on the portion of the plunger at a near end of infusion (NEOI) point of the syringe have a first size and the markings elsewhere on the portion of the plunger have a second size different than the first size such that the markings at the NEOI point allow illumination of a first number of the detectors and the markings elsewhere allow illumination of a second number of detectors different than the first number of detectors.

17. The system of claim 1 wherein the plunger includes a marker indicative of the position of the plunger; and  
the system further comprising a detector positioned so as to interact with the marker and provide a signal indicative of the position of the marker.

18. The system of claim 18 wherein the marker comprises a spur formed on the plunger and the detector comprises a potentiometer.

19. The system of claim 1 wherein the syringe includes a syringe identification marking indicative of a characteristic of the syringe; and  
the system further comprising a syringe detection system including a detector for detecting the identification marking of the syringe, the syringe detector system adapted to provide a signal in accordance with the identification marking detected.

20. A system for infusing fluid, said system comprising:  
a rotatable threaded shaft;  
a syringe having a syringe body and plunger which directly engages the threaded shaft such that rotation of the shaft drives the plunger into the syringe;

a guide system for securing the plunger in direct engagement with the threaded shaft; and

a casing having a cover and a base for accommodating the threaded shaft, syringe, and guide system.

21. The system of claim 20 wherein the guide system comprises a first guiding element running substantially parallel to the threaded shaft and a second guiding element carried by the plunger at a position substantially opposite the position at which the plunger engages the threaded shaft such
- 5 that the first and second guiding elements engage.

22. The system of claim 21 wherein the first guiding element is carried by the cover.

23. The system of claim 21 wherein the first guiding element is carried by the base.

24. The system of claim 21 wherein the first guiding element is adapted to interfere with the plunger if the syringe is not correctly seated in the casing thereby preventing closure of the cover.

25. The system of claim 20 wherein the casing has a hinged cover.

26. The system of claim 21 wherein the cover is hinged about the central axis of the threaded shaft.

27. The system of claim 20 wherein the syringe comprises a plurality of markings adapted to indicate the movement and position of the plunger within the syringe body.

28. The system of claim 27 wherein an area between the markers is substantially opaque and the markings comprise substantially transparent portions.

29. The system of claim 28 further comprising a detection system having a light source and a plurality of detectors, the detection system positioned adjacent the markings such that the light source is on one side of the markings and the plurality of detectors is on the opposite side of the markings and wherein the markings at a near end of infusion (NEOI) point of the syringe have a first size and the markings elsewhere have a second size different than the first size such that the markings at the NEOI point allow illumination of a first number of the detectors and the markings elsewhere allow illumination of a second number of detectors different than the first number of detectors.

30. The system of claim 20 wherein the plunger includes a marker indicative of the position of the plunger; and

the system further comprising a detector positioned so as to interact with the marker and provide a signal indicative of the position of the marker.

31. The system of claim 30 wherein the marker comprises a spur formed on the plunger and the detector comprises a potentiometer.

32. The system of claim 20 wherein a switch is provided on the casing, the switch being activated by correct registration of the syringe in the casing and closure of the casing to allow rotation of the threaded shaft, incorrect registration of the syringe in the casing or closure of the casing disabling rotation of the threaded shaft.

33. The system of claim 20 further comprising a clamp for securing the syringe body to the casing.

34. The system of claim 20 wherein the syringe includes a syringe identification marking indicative of a characteristic of the syringe; and the system further comprising a syringe detection system including a detector for detecting the identification marking of the syringe, the syringe  
5 detector system adapted to provide a signal in accordance with the identification marking detected.

35. A plunger for engaging a threaded shaft and for expelling fluid from a syringe body, said plunger comprising:  
a plunger stem having a distal end and a proximal end;  
a stopper positioned at the distal end of the stem, the stopper sized to fit  
5 within the syringe body; and  
a flange positioned at the proximal end of the stem, the flange having a threaded portion sized to engage the threaded shaft.

36. The plunger of claim 35 wherein the threaded portion is molded into the flange.

37. The plunger of claim 35 wherein the threaded portion comprises at least one recessed half-nut.

38. The plunger of claim 35 wherein the edges of the flange adjacent the threaded portion are formed to guide the threaded portion onto the threaded shaft.

39. The plunger of claim 35 wherein a guide slot is provided on the plunger substantially opposite the threaded portion.

40. The plunger of claim 35 wherein the plunger stem comprises an open area in the area extending from the threaded portion to the stopper to receive the threaded shaft.

41. The plunger of claim 35 wherein the plunger comprises a plurality of markings adapted to indicate the movement and position of the plunger within the syringe body.

42. The plunger of claim 41 wherein the plurality of markings comprise a linear grid.

43. The plunger of claim 41 wherein an area of the plunger between the markers is substantially opaque and the markings comprise substantially transparent portions.

44. The plunger of claim 35 further comprising a marker indicative of the position of the plunger, the marker mounted so as to move with the plunger.

45. The plunger of claim 41 further comprising a detection system having a light source and a plurality of detectors, the detection system positioned adjacent a portion of the plunger on which the markings are located such that the light source is on one side of the portion of the plunger and the plurality of detectors is on the opposite side of the portion of the plunger and wherein the markings on the portion of the plunger at a near end of infusion (NEOI) point of the syringe have a first size and the markings elsewhere on the portion of the plunger have a second size different than the first size such that the markings at the NEOI point allow illumination of a first number of the detectors and the markings elsewhere allow illumination of a second number of detectors different than the first number of detectors.

46. A syringe for use in a fluid delivery apparatus having a threaded shaft, said syringe comprising:

a syringe body;

a plunger stem having a distal end and a proximal end;

5 a stopper positioned at the distal end of the stem, the stopper sized to fit within the syringe body; and

a flange positioned at the proximal end of the stem and outside of the syringe body, the flange having a threaded portion sized to engage the threaded shaft.

47. The syringe of claim 46 wherein the threaded portion is molded into the flange.

48. The syringe of claim 46 wherein the threaded portion comprises at least one recessed half-nut.

49. The syringe of claim 46 wherein the edges of the flange adjacent the threaded portion are formed to guide the threaded portion onto the threaded shaft.

50. The syringe of claim 46 wherein a guide slot is provided on the plunger substantially opposite the threaded portion.

51. The syringe of claim 46 wherein the plunger stem comprises an open area in the area extending from the threaded portion to the stopper to receive the threaded shaft.

52. The syringe of claim 46 wherein the plunger comprises a plurality of markings adapted to indicate the movement and position of the plunger within the syringe body.

53. The syringe of claim 52 wherein the plurality of markings comprise a linear grid.



54. The syringe of claim 52 wherein an area of the plunger between the markers is substantially opaque and the markings comprise substantially transparent portions.

55. The syringe of claim 46 wherein the plunger includes a marker indicative of the position of the plunger, the marker mounted so as to move with the plunger.

56. The syringe of claim 46 wherein the syringe includes a syringe identification marking indicative of a characteristic of the syringe; and

the system further comprising a syringe detection system including a detector for detecting the identification marking of the syringe, the syringe  
5 detector system adapted to provide a signal in accordance with the identification marking detected.